

REMARKS

In response to the Final Office Action dated October 24, 2007, having a shortened statutory period for response set to expire on January 24, 2008, Applicant respectfully requests entry and consideration of the following amendments and remarks.

Claims 1, 3-14, and 20-22 are currently pending in the Application.

Claims 1, 3-5, 7, 13, 14, 21, and 22 are currently amended in this Response.

Claims 2, 15-19 have been cancelled.

Claims 9-11 have been previously amended.

I. Claim Rejections -- 35 USC § 112

The Office Action rejected claims 1-22 under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Applicant has amended Claim 1 to more particularly point out and distinctly teach a toughened material comprising a polycrystalline diamond material that is integrated with a second material selected from the group consisting of: an iron, an iron alloy, a copper, a copper alloy, a carbide, a cerametic, and combinations thereof. Support for this amendment exists in Claims 17-19, as filed. The limitations of Claims 17-19 have been incorporated into Claim 1, and Claims 17-19 have been cancelled.

Claim 1 therefore describes a toughened material having two ingredients: a polycrystalline diamond material, and a second material with which the polycrystalline diamond material is integrated.

Claim 1 further describes that the second material comprises a substantially continuous matrix in which granules of the diamond material are dispersed. The second material has a degree of ductility greater than that of the granules of diamond material.

The term “material temperature” is used synonymously to mean “temperature of the polycrystalline diamond material.” The term “material temperature” has been selected to differentiate the temperature of the polycrystalline diamond material from the temperature of the chamber of the thermal control apparatus, dubbed the “chamber temperature.”

During the formation of the toughened material, the temperature of the chamber of the thermal control apparatus differs from the temperature of the polycrystalline diamond material. The temperature of the chamber in relation to the temperature of the polycrystalline diamond material is integral for controlling the rate of temperature change for the polycrystalline diamond material, preventing over-stressing of the polycrystalline diamond material. For this reason, the term “material temperature” must be used to differentiate the temperature of the polycrystalline diamond material from the “chamber temperature” of the chamber of the thermal control apparatus.

Claims 3-14 and 20-22 depend upon Independent Claim 1. Because Applicant believes that Claim 1, as amended, properly points out and distinctly claims the subject matter which

Applicant regards as the invention, Applicant believes that Claims 3-14 and 20-22 also properly point out and distinctly claim the subject matter which Applicant regards as the invention

The Office Action rejected claims 1-22 under 35 USC § 112, first paragraph, as failing to comply with the written description requirement.

Applicant's Claim 1, as amended, teaches a toughened material comprising a polycrystalline diamond material integrated with a second material that has been subjected to a process comprising multiple cryogenic and thermal treatments.

The steps of the process are enumerated in Applicant's Claim 1, as amended, in Figure 1, and in Paragraphs [00018] and [00022] through [00030] of Applicant's Specification, as filed.

A drawing and description of a useable thermal control apparatus is provided in Figure 2, and in Paragraphs [00019] through [00021] of Applicant's Specification, as filed.

Applicant notes that the toughened material can be formed by subjecting numerous types of polycrystalline diamond materials to the steps described in Claim 1, including pre-existing items that include a diamond laminate with other materials, however Applicant has cancelled Claims 15 and 16.

II. Claim Rejection – 35 USC § 102 and 35 USC §103

The Office Action rejected claims 1 – 22 under 35 U.S.C. § 102(b) as anticipated or, in the alternative, under 35 U.S.C. § 103(a) as obvious over *Lundin et al.* (5103701).

Applicant teaches a toughened material comprising a polycrystalline diamond material integrated with a second material. The second material comprises a substantially continuous matrix in which granules of the polycrystalline diamond material are dispersed. The second material has a degree of ductility greater than that of the granules of the polycrystalline diamond material.

The polycrystalline diamond material is cooled to a first target temperature at a first temperature rate, heated to a second target temperature at a second temperature rate, cooled to a third target temperature at a third temperature rate and heated to a fourth temperature at a fourth temperature rate to form the toughened material. (Applicant's Claim 1, as amended)

Lundin et al. describe an apparatus for machining metals that detrimentally react with diamond cutting tools, in which the workpiece and diamond cutting tools are chilled to reduce wear on the diamond cutting tools. (*Lundin et al.*, Abstract)

Lundin et al. do not describe a toughened material formed by subjecting a polycrystalline diamond material integrated with a second material to repeated cryogenic and thermal tempering cycles.

Lundin et al. do not teach a second material having a substantially continuous matrix in which granules of the polycrystalline diamond material are dispersed, nor do *Lundin et al.* teach the second material having a degree of ductility greater than that of the granules of polycrystalline diamond material.

Lundin et al. teach only chilling a diamond tipped cutting tool and do not describe the components of the tool or improved structural characteristics resulting from the chilling, only

reduced wear due to the inhibition of reactions that occur between the tool and workpiece at the cooler temperature.

Applicant's use of cryogenic and heated tempering cycles provides a toughened material with improved structural characteristics. (Applicant's Specification, as filed, Paragraph [00028]) Further, Applicant's use of controlled rates at which the polycrystalline diamond material is heated and cooled prevents stressing or fracturing of the diamond material, which can be caused by less controlled temperature changes. (Applicant's Specification, as filed, Paragraphs [0004] and [00022])

Lundin et al. do not teach specific target temperatures to which the diamond tipped cutting tool or the workpiece are to be cooled. *Lundin et al.* fails to teach rates of temperature change at which the items are to be cooled. *Lundin et al.* teach use of a tool and workpiece under refrigerated conditions to prevent wear on the cutting tool, rather than to provide improved structural characteristics to the tool. Applicant's target temperatures and temperature rates of change are selected to prevent stressing or fracturing of the polycrystalline diamond material during repeated cryogenic and heating cycles, resulting in the formation of a toughened material with improved structural characteristics.

Further, *Lundin et al.* do not teach performing any type of heated tempering cycles on the diamond tipped tools or the workpieces. *Lundin et al.* instead solely teach cooling diamond cutting tools and workpieces, during use, for the purpose of reducing wear.

Applicant teaches treating a polycrystalline diamond material by cooling the polycrystalline diamond material to a first target temperature at a first temperature rate, which

avoids overstressing or fracturing the polycrystalline diamond material. (Applicant's Specification, as filed, Paragraph [00022]). The polycrystalline diamond material is then heated to a second target temperature at a second temperature rate, cooled to a third target temperature at a third temperature rate, and heated to a fourth target temperature at a fourth temperature rate. (Applicant's Claim 1, as amended).

Applicant appreciates the Examiner's time and attention to this matter. Applicant believes no new matter has been added with any amendments that have been made. Applicant believes claims as now provided overcome all noted rejections. Reconsideration of this application is respectfully requested.

Respectfully submitted,



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